



Allegato1

**Scheda di partecipazione per l'assegnazione di fondi per
Progetti di Ricerca sviluppati da singoli Ricercatori- Anno2023**

TITOLO DELLARICERCA

Metals recovery from industrial wastewaters by
microalgae

PAROLECHIAVE

1	Wastewater valorization
2	Bioremediation
3	Metals recovery
4	Microalgae technology

PROPONENTE

COGNOMEENOME

Cosenza Alessandro

RUOLO

RTD-a

E-MAIL

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SSD

ING-IND/25

EVENTUALI COLLABORAZIONI

N.	COGNOME E NOME	RUOLO	UNIVERSITA'/ORGANIZZ. ESTERNA
1	Zaffora Andrea	RTA-a	UNIPA
2	Lima Serena	RTD-a	UNIPA
3			



SCOPO, DESCRIZIONE E RISULTATI ATTESI DELLA RICERCA

Stato dell'arte (max 10 righe):

Microalgae are microorganisms with adaptive capabilities due to their physiologic structure. They also grow in the most extreme aquatic environments. As well known, many microalgae species can remove pollutants from wastewater, using them as nutrients for their growth. Sewage treatment is an attractive microalgae application, because of their ability to assimilate nutrients and bio-absorb metals and heavy metals. In particular, microalgae removed metals primarily by absorbing them into their cells, by storing metals in vacuoles. Among the metals present in the polluted wastewater produced by industries, there are some of them with an economic value. For example, nickel, cadmium, and chromium, widely present in metallurgic wastewaters, have a high economic value. Additionally, metals like vanadium, germanium, and gallium, used in semiconductor production, are considered critical raw materials due to their supply risk.

Obiettivi, ipotesi e metodologia (max 12 righe):

The present project proposal starts with the use of different microalgae species for an advanced treatment of industrial wastewater containing dissolved metals. At the same time, the main goal of the project is the exploitation of the microalgae capability of bio-accumulating metals to recover valuable metals. Starting from species acclimated in metal-rich cultivations, the best microalgal strain will be identified, focusing on the bio-absorption of single critical metals present in metallurgic and semiconductor wastewater. Many parameters will be studied such as the type of metal, different kinds of culture media, and the pH and temperature effect. ICP-MS and FTIR spectroscopy will be employed to identify the presence and concentration of metals. After the cultivation phase, different methods of cell disruption and metal recovery (chemical and electrochemical) will be explored, such as reactive crystallization and electrodeposition. Moreover, the effect of the presence of metals in the algal environment will be detected by analyzing the response on the microalgal growth together with the lipid, carbohydrates, and protein production.

Risultati attesi (max 5 righe):

Although the bioremediation of metal-rich wastewater by microalgae is intensively studied, the subsequent recovery of valuable metals is an unexplored and challenging area. To find species of microalgae capable of adapting well in a polluted stream and bio-absorb metals, and to study the best available techniques for chemical and electrochemical harvesting, will draft a pathway for future works.



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Dipartimento di Ingegneria
Direttore: prof. Antonino Valenza



Caratteristiche di interdisciplinarietà del progetto (max 5 righe):

The work will cover several research areas, starting from microalgal cultivation and selection. Identifying the optimal culture media for microalgae growth, and closely monitoring their key responses necessitates extensive experience in this domain. The separation of metals from biomass is an interesting issue that will include chemical and electrochemical expertise in the engineering field.

DESCRIZIONE DEL PRODOTTO DELLA RICERCA (tipologia, collocazione editoriale, co-autore straniero eventualmente previsto, tempi attesi)

One or two publications in Q1 journals will be presented before 2024, for example:

- “Metal recovery strategies by autochthonous microalgae” in “Separation and Purification Technology”.
- “(Vanadium) recovery from metallurgic wastewater through microalgae”, in “Chemical Engineering Journal”.



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FINANZIAMENTO RICHIESTO (max1.500,00€)

1.500,00€

DESCRIZIONE DELLE SPESE PREVISTE

- Reagenti e consumabili: 900,00 €
- Uso apparecchiature comuni per analisi: 200,00 €
- Partecipazione a conferenze e diffusione risultati: 400,00 €

Il sottoscritto, proponente del progetto, dichiara:

- Di non avere disponibilità di fondi di ricerca per un importo superiore a 5.000 €;

Luogo e data 06/11/2023

Firma F.To Alessandro
Cosenza
